

I claim:

1. A method of operating a falling film plasma reactor comprising the step of flowing a liquid dielectric over the surface of a first electrode.

5 2. The method of claim 1, further comprising the step of flowing said liquid dielectric over a second electrode.

3. The method of claim 2, wherein said first electrode is an inner electrode having an outer surface, said second electrode is an outer electrode having an inner surface, said flowing over the surface of said first electrode is over said outer surface of said inner electrode, and said flowing over the surface of said second electrode is over said inner surface of said outer electrode.

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4. The method of claim 1, further comprising the following steps; where said gas or gas mixture enters the Falling Film Plasma Reactor, flows into the annular region comprising the plasma, the dielectric or conductive liquids, and any solid surfaces of the reactor, and contacts simultaneously or in sequence the plasma, the liquids, and any solid surfaces of the reactor; whereupon components of said gas or gas mixture react with components of the plasma, the liquids, and any solid surfaces of the reactor; whereby the components of said gas or gas mixture are modified and subjected to further contact and processes comprising the plasma, the liquids, and any solid surfaces of the reactor; whereby the plasma, the liquids, and any solid surfaces of the reactor are modified and subjected to further processes by the plasma, the liquids, any solid surfaces of the reactor, and said gas or gas mixture; where the plasma, the

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liquids, any solid surfaces of the reactor, and said gas or gas mixture are acted upon by secondary processes comprising changes in flow, composition, reactivity, temperature, pressure, contact duration, and contact sequence; whereupon results comprising decomposition, formation, combination, separation, recovery, circulation, and exhaust are achieved through multiple processes.

5. The method of claim 1, further comprising the following steps; where said particulate or particulate mixture enters the Falling Film Plasma Reactor, flows into the annular region comprising the plasma, the dielectric or conductive liquids, any solid surfaces of the reactor, and any gas or gas mixture, and contacts simultaneously or in sequence the plasma, the liquids, any solid surfaces of the reactor, and any gas or gas mixture; whereupon components of said particulate or particulate mixture react with components of the plasma, the liquids, and any solid surfaces of the reactor; whereby the components of said particulate or particulate mixture are modified and subjected to further contact and processes comprising the plasma, the liquids, any solid surfaces of the reactor, and any gas or gas mixture; where the plasma, the liquids, any solid surfaces of the reactor, any gas or gas mixture, and said particulate or particulate mixture are acted upon by secondary processes comprising changes in flow, composition, reactivity, temperature, pressure, contact duration, and contact sequence; whereupon results comprising decomposition, formation, combination, separation, recovery, circulation, and exhaust are achieved through multiple processes.

6. The method of claim 1, further comprising the following steps; where said liquid or liquid mixture enters the Falling Film Plasma Reactor, flows into the annular region comprising the plasma, the dielectric or conductive liquids, any solid surfaces of the

reactor, and any gas or gas mixture, and contacts simultaneously or in sequence the plasma, the liquids, any solid surfaces of the reactor, and any gas or gas mixture; whereupon components of said liquid or liquid mixture react with components of the plasma, the liquids, and any solid surfaces of the reactor; whereby the components of said liquid or liquid mixture are modified and subjected to further contact and processes comprising the plasma, the liquids, any solid surfaces of the reactor, and any gas or gas mixture; where the plasma, the liquids, any solid surfaces of the reactor, any gas or gas mixture, and said liquid or liquid mixture are acted upon by secondary processes comprising changes in flow, composition, reactivity, temperature, pressure, contact duration, and contact sequence; whereupon results comprising decomposition, formation, combination, separation, recovery, circulation, and exhaust are achieved through multiple processes.

7. A falling film plasma reactor using high voltage alternating current or pulsed direct current applied to radially spaced cylindrical electrodes to generate dielectric breakdown of a process gas within a large radial gap comprising a first inner electrode having an outer surface, a second outer electrode having an inner surface, wherein said first inner electrode is configured to allow a liquid dielectric to flow as a film over said outer surface of said first inner electrode.

8. A falling film plasma reactor comprising radially spaced cylindrical electrodes, and a large radial gap between the electrodes configured to allow a dielectric liquid to flow over at least one of said electrodes, and further configured to allow a process gas to contact said liquid dielectric flowing over at least one of said electrodes.